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ABSTRACT

This paper discusses specification and interpretation of human capital models of women's earnings when data on actual work experience are available. It uses the segmented earnings function framework developed by Jacob Mincer and Solomon Polachek and considers the effects of data errors, issues involving data interpretation, consequences of model mis-specification, and the simultaneity problem. The male-female wage gap is reexamined in light of these considerations. It is concluded that appropriate analysis of the corrected data does not support originally published conclusions concernig the shape of the on-the-job investment profile, the importance of "depreciation" of human capital, and the proportion of wage gap that can be explained by differences in work experience between men and women. (Author/JT)

THE THEORY OF HUMAN CAPITAL AND THE EARNINGS OF WOMEN: A RE-EXAMINATION OF THE EVIDENCE

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Abstract

This paper discusses specification and interpretation of human capital models of women's earnings when data on actual work experience are available. It uses the segmented earnings function framework developed by Jacob Mincer and Solomon Polachek and considers the effects of data errors, issues involving data interpretation, consequences of model mis-specification, and the simultaneity problem. The paper also re-examines the male-female wage gap in light of our criticisms. Appropriate analysis of the corrected data does not support originally published conclusions concerning the shape of the on-the-job investment profile, the importance of "depreciation" of human capital, and the proportion of wage gap that can be explained by differences in work experience between men and women.

I. INTRODUCTION

Several recent articles [1, 8, 9, 10] have raised issues concerning the appropriate specification of human capital models of earnings, the interpretation of regression coefficients in these models, and potential biases in measuring sex discrimination. This paper extends the discussion by examining both the empirical specification of human capital models of earnings in the presence of discontinuous work experience over the life cycle and simultaneous-equations models of wage determination and labor-supply. While the previous discussion has dealt mainly with models where data on actual work experience were not available, this paper considers specification and interpretation of human capital models when such data are available, as in the National Longitudinal Surveys of Work Experience of Women aged 30-44 (NLS).[1]

An earlier study [5] has used the NLS data to estimate segmented earnings functions for married women, dividing lifetime work experience into several intervals and interpreting differences in the coefficients for these intervals as reflecting life-cycle differences in human capital accumulation through investment in on-the-job training. It is our contention that the econometric specification that has been used in that study does not provide correct tests of certain aspects of the theoretical model, and that evidence adduced from a more appropriate specification of the model does not support the life-cycle investment hypothesis. Furthermore, the correct specification substantially reduces the proportion of the male-female wage gap that can be explained by differences in work experience between men and women.

This paper is organized in the following manner: the use of general and firm-specific experience measures in human capital models is discussed in Section II; Section III is concerned with theoretical and empirical issues dealing with the simultaneous equations model and the implications for analysis of the wage gap; and in Section IV we present some brief conclusions.

II. SPECIFIC TRAINING, GENERAL TRAINING, AND THE EARNINGS OF WOMEN

The human capital interpretation of experience-earnings profiles is implicitly concerned with general training--training paid for by the worker through reduced wages in the early years, and resulting in increased productivity and higher wages in the later years. A related but separate concept of firm-specific training, an investment in skills useful only to a particular employer, is often used to explain the relationship between seniority and earnings [3, 4]. Exact empirical measures of these theoretical constructs are never available, forcing economists to use years of labor market experience (or perhaps experience related to the current job) as a proxy for general training and tenure with the current employer as a proxy for specific training.

In a recent, widely cited paper [5] dealing with human capital investments over the life histories of women, Jacob Mincer and Solomon Polachek have blurred the general/specific distinction and have misused the NLS data. Their conclusion that the job-related investments by married women are greater in the post-maternal period than in the pre-maternal period, in contrast to the monotonically declining investment

profile for men, follows from their asymmetric specification of the wage function. Specifically, they estimate the return to general experience for the early interval (number of years in the labor force) and the combined return to general and specific training for the most recent period (number of years with current employer).[2]

Following Mincer and Polachek (M-P), we decompose the work histories of employed married women with children into several distinct stages: (1) the number of years of work in the labor market between the termination of schooling and the birth of the first child (e_1), (2) the number of years of non-participation in the labor market between the time of marriage and the resumption of work after the birth of the first child (h_1); and (3) the number of years worked since birth of the first child (e_5). Clearly, some portion of this third period constitutes (4) the period of tenure in the woman's current job (e_3). In the context of the discussion above, the first three of these stages are relevant to the accumulation (or depreciation) of general human capital, while the fourth relates to investment in specific human capital.[3]

The measure that M-P use for what they call "current work experience" (e_3) is tenure at current job. They then use another variable (e_2) to measure post-maternal work experience outside of the current job. It is our contention that this is inappropriate in a model where the accumulation of general training (rather than firm-specific training) is supposed to be the important determinant of earnings. Since the NLS data provide a measure of total labor market experience since the birth of the first child, this measure (e_5), rather than tenure at the most

recent job, should be used in testing the theory. If firm-specific training is also thought to be important, tenure on the current job (e_3) should be included as an independent variable along with the length of total labor market experience since the birth of the first child (e_5). In this specification of the earnings function, the regression coefficient for job tenure can be interpreted as the return to firm-specific training (since the regression holds general experience constant) and the coefficient(s) for years of labor force experience can be interpreted as the return to general training (since the length of firm-specific training is held constant).

In Table 1, Equation 1 is M-P's original equation (Table 4, Equation 3, p. S90). Equation 2 is our re-estimate of their equation, using the same specification, but corrected data.[4] Equation 3 uses the two general experience intervals (e_1 and e_5) and excludes the variable measuring current job tenure (e_3). Equation 4 includes tenure at current job as well as the general experience intervals.

* * TABLE 1 * *

The re-estimation of wage functions with the more appropriate specifications weakens the empirical support for M-P's model of women's earnings. By comparing the regression coefficients of e_3 and e_1 in Equation 1, they found that "white married women with children (with spouse present) have current investment (ratio) which exceeds the investment (ratio) incurred in experience before the first child" (p. S93). This difference is .005 in Equation 2 (our replication of their equation). However, where the most recent interval is defined as years worked between

TABLE 1

WAGE FUNCTIONS: WHITE WOMEN, MARRIED, SPOUSE PRESENT, WITH CHILDREN[a, b, c]

Description	Equation (1)		Equation (2)		Equation (3)		Equation (4)	
Independent	M-P's Original Equation		M-P's Specification corrected data		General Experience Intervals without Tenure		General Experience Intervals Plus Tenure	
Variables	b	t	b	t	b	t	b	t
Constant	4.70[d]		4.33	33.48	4.30	33.00	4.33	33.36
e_1	.008	2.8	.010	2.52	.010	2.54	.009	2.22
e_2	.001	0.3	.002	0.51				
e_3	.012	2.7	.015	4.27			.011	3.62
e_5					.008	2.47	.003	0.85
h_1	-.012	-2.5	-.004	-1.48	-.004	-1.31	-.004	-1.35
h_2	-.003	-0.7	-.001	-0.27	-.001	-0.31	-.001	-0.19
SCHOOL	.064	12.0	.057	10.81	.059	11.09	0.58	10.91
ETR	.0002	1.5	.0004	2.38	.0003	2.15	.0004	2.40
ECT	.010	3.2	.0002	0.03	.0006	0.12	.0001	0.01
HEALTH	-.0003	-1.3	-.0006	-2.40	-.0006	-2.44	-.0006	-2.43
RESIDE	.001	1.2	-.0008	-0.98	-.0004	-0.48	-.0008	-0.99
LOC	.044	2.7	.056	2.34	.053	2.20	.058	2.38
LNHRS	-.11	-3.7	-.022	-0.93	-.026	-1.10	-.023	-0.97
LNWKS	.03	1.6	.074	4.34	.083	4.93	.074	4.37
KIDS	-.008	-1.0	-.011	-1.42	-.015	-1.89	-.012	-1.51
R^2	.28		.259		.248		.258	
$\bar{R}^2$			.248		.237		.247	
SEE			.355		.358		.356	
F-ratio			23.8		24.2		23.7	
Sample Size	993		969		969		969	

(Table 1 Continued)

a The definitions of the variables are as follows:

SCHOOL	-Number of years of school completed by respondent.
e_1	-Number of years worked at least six months between school and the birth of the first child.
e_2	-Number of years worked at least six months after the birth of the first child which were not spent on the current or last job.
e_3	-Number or years spent on current or last job (tenure).
e_5	-Number of years worked at least six months after the birth of the first child.
h_1	-Number of years spent at least six months at home from marriage until the first job after the birth of the first child.
h_2	-All other home time (in years).
HEALTH	-Duration of current health limitations as of 1967 in months.
RESIDE	-Number of years spent at current residence.
LOC	-Size of place of residence at age 15, measured as a dummy variable with a value of 1 if located in an urban area with population $\geq$ 25,000 and a value of 0 otherwise.
LNWKS	-Natural logarithm of the usual weeks worked in 1966.
LNHRS	-Natural logarithm of the usual number of hours per week that were worked in 1966.
e	-Total years of work experience since leaving school.
h	-Total years spent at home after leaving school.
KIDS	-Number of children ever born.
ETR	-An interaction term constructed as the product of the number of years worked and the months of technical training.
ECT	-An interaction term with the value""0" if the respondent did not receive a certificate for additional training courses taken. Otherwise, this variable takes the number of years of experience as its value.

b The summary statistics are:

Variable Name	Mean	Standard Deviation
SCHOOL	11.47	2.48
e	10.09	6.24
h	11.02	6.50
e_1	3.16	3.24
e_2	3.46	4.51
e_3	3.69	4.60
e_5	6.93	5.44
h_1	6.86	6.24
h_2	4.16	4.81
ETR	23.7	75.7
ECT	.402	2.39
HEALTH	13.4	49.1
RESIDE	20.5	14.2
LOC	.358	.480
LNHRS	3.47	.507
LNWKS	3.46	.742
KIDS	3.02	1.58
LNWAGE 67	5.20	.41

c These results are estimated from an unweighted sample.

d Since our wage functions used a wage variable measured in cents per hour, the natural logarithm of 100 was added to M-P's constant term to make it comparable to ours.

birth of the first child and 1967 (e_5) and tenure is not explicitly included in the equation (Equation 3), the general investment ratio for the most recent period is estimated at .002 less than that for the pre-child period. When current job tenure is included in the earnings function to control for the return to firm-specific training (Equation 4), the excess of the pre-child investment ratio over the current general investment ratio widens. Thus, the corrected data properly used do not support M-P's contention concerning the shape of the on-the-job investment profile of married women. Moreover, this interpretation is strengthened by analysis of earnings functions of childless younger women, also based on NLS data.[5]

In addition, it is clear from Table 1 that there is, at best, only minimal support for the hypothesis that periods of home time result in depreciation of earning power for married women. M-P concluded that this depreciation amounted to 1.5 per cent per year, on average. However, using the corrected data we find that the coefficient for h_2 is never significant in the predicted negative direction and that the marginally significant coefficient of h_1 is only one-third the size reported by M-P.

III. LIFETIME PARTICITATION, SIMULTANEITY, AND THE MEASUREMENT OF SEX DISCRIMINATION

In the context of a life-cycle human capital approach, it is quite plausible to suggest--as M-P have noted (p. S98)--that there may be a simultaneity problem regarding wages and post-school experience. If this is indeed the case, earnings functions estimated using ordinary

least squares (OLS) will contain biased coefficients; and measures of sex discrimination based on such earnings functions will be correspondingly biased (see Appendix C).

Although many studies of sex discrimination ignore this issue, M-P's study does explicitly consider the simultaneity problem as a prelude to considering male-female wage differences. For this reason (presumably), and because of their use of a uniquely rich body of data, M-P's analysis of the wage gap has received considerable attention in policy circles.[6] However, while they have made an important contribution by discussing the simultaneity problem, a close look at their procedures reveals serious flaws in their two-stage least squares (2SLS) approach to dealing with the simultaneity problem.

A correct 2SLS procedure must rely on a first-stage equation in which work experience is regressed on variables that are not endogenous, and must also explicitly account for the endogenous aspects of home time. M-P's procedure falls short on both counts. Their implementation of 2SLS includes number of children as a variable in the first-stage equation that is used to generate predicted values of work experience ($\hat{e}$). The authors acknowledge that number of children is not exogenous with respect to lifetime labor supply. In effect, they have traded away one endogenous variable and replaced it with another. The consequent similarity between their OLS and 2SLS results is thus neither surprising nor comforting.

Further, M-P's 2SLS estimate treats work experience as endogenous and home time as exogenous. Given the nature of the relationship be-

tween the two, however, it is c r that if there is a simultaneity problem with respect to work peri , there is also a simultaneity problem with respect to home time. We attempted to re-estimate the earnings function with the corrected data, using a 2SLS approach that properly dealt with the endogenous aspects of both work experience and home time. Unfortunately, our efforts cannot be considered successful, since the re-estimated coefficients are not empirically plausible (see Appendix B).

If the endogenous aspects of home time are ignored, one can generate estimates of the earnings function which appear to be somewhat more plausible. However, this incomplete treatment of the simultaneity problem results in biased estimates of the coefficient(s) of home time. Although $\hat{e}$ is not correlated with the stochastic term in the re-estimated earnings function, h_1 is. The re-estimated earnings function still suffers from simultaneity bias, and given the negative relationship expected between h_1 and ln W, the coefficient of h_1 in the re-estimated earnings function will tend to be biased downward (i.e., too negative).[8,9] Hence, M-P's statement that "Parameter estimates in this revised earnings function [their 2SLS estimate] are theoretically superior to the original, simple least squares estimates" (p. S99) is simply not true. Their partial and incorrect efforts to deal with the simultaneity problem may be no better (and perhaps worse) than no efforts at all. In any case, the task of finding a conceptually appropriate means of resolving the simultaneity problem which results in an empirically plausible earnings function is one which remains undone.

M-P used their 2SLS estimate of the earnings function for married women to consider [illegible] nants of wage differences between married women and married men (pp. S101-04).[10] Because of the problems in their 2SLS estimating procedure, and also because of the presence of measurement errors in their data, we have re-examined the wage gap using OLS estimates of the earnings functions and the corrected data (Table 2). In order to facilitate comparison, the relevant portion of M-P's Table 12 is reproduced as the first row of our Table 2. The second row of our table shows an analysis of the wage gap based on an OLS estimate of the earnings function, using the corrected data.[11]

* * TABLE 2 * *

The first column of the table shows the estimated re[illegible]e contribution (at the means) of postschool experience to (the log of) wage rates--determined by multiplying the female work experience and home time coefficients by the mean values of the variables for women and summing. The numbers in column (2) show the relative contribution to women's wages implied by the female experience coefficients and male experience.

Column (3) p[illegible]ovides the answer to the following question: how much would the sex differential in wage rates narrow if work experience of women were as long as that of men, but the female coefficients remained as they are? That is, the difference between the effects of men's experience (column 2) and the actual effects of women's experience (column 1) is used to estimate how much of the wage gap between men and women is accounted for by the difference in work experience be-

TABLE 2

ESTIMATED EFFECTS OF WORK EXPERIENCE ON WAGE RATES--

WHITE MARRIED WOMEN, SPOUSE PRESENT

Sources of Estimate	Relative Contributions of		Percent of Wage Gap Explained		
	Actual Experience	Men's Experience			
	(1)	(2)	(3)	(4)	(4')[a]
(1) M-P 2SLS	+.02	+.26	45	42	32
(2) Corrected data, OLS	+.14	+.25	20	23	25

[a]The procedure used by M-P to generate the estimates in column (4) of their Table 12 is not entirely clear from their discussion, and we have been unsuccessful in our attempts to seek clarification of the matter from them. We have therefore provided two column (4) estimates -- the first one (4) having the property that it results in the same number (for row 1) as that reported by M-P; while the second one (4') is more in line with what the calculation should presumably be telling the reader. For further clarification, see Appendix C.

tween the two groups.[12] Conversely, we may ask how much the sex differential in wage rates would narrow if the work experience coefficients for women were equal to those for men, but the difference in duration of work experience remained. Column (4) of Table 2 gives the results of applying this converse procedure.

Table 2 shows that the new estimates result in a considerable increase in the estimated contribution of actual experience to women's earnings (column 1), and a corresponding decrease in the percentage of the wage gap that can be attributed to sex differences in work experience (columns 3 and 4'). More specifically, the differences between the two rows reflect both the effect of the corrections in the data and the effect of using an OLS estimate rather than the biased 2SLS estimate. Both effects result in increases in the estimated contribution of actual experience to women's earnings.[13]

Thus, our estimates suggest that the differences in the work experience histories of men and women directly account for only one-fifth to one-fourth of the difference in wages between the two groups. This contrasts sharply with M-P's estimates of nearly one-half, based on incorrect data and a conceptually less appropriate estimating procedure. Hence, our estimates suggest that labor market discrimination could play a larger role in explaining the male-female wage gap than M-P originally implied.[14]

IV. CONCLUSION

Since the specification of the equations estimated in Section II was constrained so that the equations would be as similar as possible to those estimated by M-P, we would like to take this opportunity to omit the variables "h_2", "ETC", "RESIDE", "LOC", "LNHRS", and "KIDS" and to include a variable which measures the size of the current area of residence.[15] This wage function is presented in Table 3 below.

On the basis of this equation and the previous results we conclude that there is no evidence of greater investment in general training in the interval of labor force participation after the birth of the first child than in the previous period, and that the effect of "depreciation" of human capital on women's earnings is less than one-half of 1 per cent per year out of the labor force (about one-third of the magnitude originally reported). In addition, the contribution of differences in work experience between men and women in explaining wage differences by sex is substantially less than indicated by M-P.

* * TABLE 3 * *

TABLE 3

PREFERRED WAGE FUNCTION[a]

(DEPENDENT VARIABLE=Ln WAGE)

Variable Name	Regression Coefficient	t-Statistic
Constant	4.173	51.04
SCHOOL	.060	12.72
e_1	.009	2.29
e_3	.011	3.78
e_5	.002	0.80
h_1	-.004	-1.95
ETR	.0004	2.35
LNWKS	.072	4.29
HEALTH	-.0005	-2.33
CITSIZ	.00003	5.12
R^2	.270	
$\bar{R}^2$	.263	
F-ratio	39.47	
SEE	.352	

Sample size = 969 (White married women with children, spouse present.)

[a] See Table 1 for explanations and means of the variables.

Footnotes

[1]For a complete description of the NLS data for women, see [7].

[2]In addition, since a woman's recent experience with her current employer is more likely to be related to her current job than is experience ten years in the past with a different employer, the job relevance as well as the timing of the experience must be considered in interpreting the two regression coefficients.

[3]It is possible that women who worked for the same employer before and after bearing children might have received firm-specific training before the period of current job tenure; however, since attachment to the same employer is probably not very common, the description above should be generally accurate.

[4]An error in coding of the respondent's work history between the birth of her first child and 1967, which has now been corrected, is likely to have biased some of the M-P regression results. The error resulted in an understatement of the work experience and over-statement of home time of some of the women in the sample used in the regressions. Detailed examination of the data has revealed that some women not in the labor force during the survey week in 1967 had erroneously been coded NA for work experience in this interval on the data tape that M-P had acquired from the Census Bureau. Since women who were not in the labor force in 1967 had, on average, lower wages and lower post-child labor force experience than other women, the regression coefficients in M-P's published equations for experience and home time in this interval may be biased. See Appendix Table A-1 for an examination of the effect of the data correction on the experience intervals.

[5]In this connection, we have estimated an earnings function for 693 childless young white women aged 14-24 in 1968 using the NLS data, regressing the natural logarithm of the wage on schooling, potential experience prior to the current job (age-schooling-6-tenure), and tenure on current job. Since these young women have not yet begun to drop out of the labor force to bear children, their potential experience may be taken as a reasonably accurate proxy for their actual work experience. In the context of M-P's interpretation of the earnings function for married women, we would expect the coefficient of prior potential experience to be equal to the coefficient of current job tenure for the young women, since both "intervals" are part of e_1--number of years worked between school and the birth of the first child. In fact, the estimated equation is (t-values are in parentheses):

$$\ln W = \underset{(35.9)}{3.79} + \underset{(13.5)}{.106}\, S + \underset{(5.1)}{.040}\, e_{po} + \underset{(7.6)}{.068} e_3 \qquad R^2 = .232, \text{ where}$$

S = number of years of school completed, e_{po} = potential experience prior to the current job, and e_3 = number of years spent on current job (tenure). The two experience coefficients are clearly not equal--the coefficient of tenure is considerably (and significantly) higher than the coefficient of prior potential experience. We believe that the coefficient of prior potential experience is reflecting the effects of general human capital accumulation on earnings, while the coefficient of current job tenure reflects returns both to general and to firm-specific human capital. The implication of this view is that M-P's interpretation of the coefficient of e_3 in their earnings function for married women is wrong. They argue that the tenure coefficient is higher than the coefficients of previous work experience intervals, reflecting greater investment in on-the-job training because these women have completed their child-bearing and now intend to remain in the labor force for an extended period of time. However, our contention is that the tenure coefficient is higher primarily because it is reflecting the combined effects of general and firm-specific training.

[6] See, for example, [11, p. 155; 12, pp. 3-5; and 13, pp. 119-120].

[7] That is, work experience and home time are, by definition, exhaustive components of potential work experience (years since school). It is incongruous to treat work experience as endogenous while treating home time as exogenous, since the argument underlying the treatment of work experience as endogenous (p. S98) is applicable to home time as well.

[8] Comparison of this partial 2SLS estimate with the corresponding OLS estimate (see Appendix B, equations 1 and 4) reveals that the coefficients of total experience and of tenure are slightly larger in the 2SLS estimate, while the coefficient of home time is tripled in absolute value. These findings are similar to those of M-P. Comparison of their OLS and 2SLS coefficients (Table 9, p. S100) indicates that moving from the OLS to the 2SLS estimate results in a minimal increase in the coefficient of total work experience, no change in the tenure coefficient, a near doubling of the coefficient of h_1 (and a considerable increase in its t-value), and a ten-fold increase in the coefficient of h_2 (as well as a change in sign from positive to negative and a considerable increase in its t-value). Thus, the large increases in the home-time coefficients that occur in their treatment of the simultaneity problem suggest that the simultaneous equations bias is being picked up by the home-time coefficients in their 2SLS estimates.

[9] The importance of the size of the estimated coefficient(s) of home time are discussed further in the following section (see footnote 13), and in Appendix C.

[10] They estimated an earnings function for white married men aged 30 to 44 from the Survey of Economic Opportunity (SEO) data for 1966, and then "inquired to what extent the...wage ratio (152 per cent) of married men to married women...can be explained by differences in work histories and by differences in job investment and depreciation" (p. S102). In general, they concluded that nearly half of the wage gap could be directly attributed to differences in work histories, and they argued that this figure is probably an understatement of the role of duration-of-work-experience in contributing to the wage gap (pp. S102-04).

[11] We have omitted h_2 (other home time) from the earnings function used to generate the numbers in row 2. When included, the coefficient is never significant and its omission results in only minor changes in the numbers in the table. The earnings function used, then, regresses ln W on e, e_3, h_1, and SCHOOL, for a sample of 1028 white women, married, spouse present. The estimated coefficients and corresponding means for the three postschool experience variables are shown in Appendix D.

[12] Column (4') gives alternate estimates (to those in column 3) of how much of the wage gap can be accounted for by differences in post-school experience. Evaluating these differences using the female experience coefficients provides the column (3) estimates; evaluating the differences using the male coefficients provides the column (4') estimates. For a more complete discussion of the derivation of these estimates, see Appendix C.

[13] For comparative purposes, we have done an analysis of the wage gap based on M-P's OLS estimate of the earnings function (i.e., using the incorrect data). The resulting estimates are +.07, +.22, 29 per cent, 32 per cent, and 32 per cent, respectively, for columns (1) through (4') in Table 2. The deviations of these estimates from those based on M-P's 2SLS results are due primarily to the difference in home-time coefficients.

[14] As M-P note (p. S103), that portion of the wage gap which is unexplained (by differences in those factors which determine wages) may be taken as an upper limit of the direct effects of labor market discrimination. Our estimates of this residual (when differences in postschool experience only are considered) are substantially larger than those of M-P, and are closer to estimates reported by Blinder [2] and Oaxaca [6].

[15] The variables h_2 and ECT are eliminated because they are not statistically significant. "RESIDE" and "KIDS" have no readily apparent interpretations with tenure and detailed work experience measures already in the wage function. The size (in thousands of persons) of the 1967 place of residence, "CITSIZ", is a more appropriate candidate for inclusion in the equation than "LOC", size of place of residence at age 15.

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APPENDIX A

Table A-1 is a replication of the work histories in M-P's Table 2 using the revised (correct) data. It should be noted that M-P's Table 2 contains a number of discrepancies and errors, apart from those caused by errors in the data. M-P's explanations of the variables provided at the base of Table 2 are not consistent with the description of the variables contained in their Appendix. In addition, the home-time intervals reported by M-P do not add up to total home time for the two groups of particular interest here: for white women with children, married once, spouse present, M-P report $\overline{\Sigma h}$ = 10.4 years, while $(\overline{h}_1 + \overline{h}_2 + \overline{h}_3)$ = 8.5 years; and at the same time, for white women without children, married once, spouse present, M-P report $\overline{\Sigma h}$ = 3.3 years, while $\overline{h}_1$ = 1.01 years and $\overline{h}_3$ = 3.35 years.

TABLE A-1

DUPLICATION OF MINCER-POLACHEK TABLE II

NEW TAPE: CORRECTED WORK EXPERIENCE

INTERVALS BY MARITAL STATUS

Group	Variable									
	h_1	e_1	h_2	e_2	h_3	e_3	Σe	Σh	S	Sample Size
White, with children										
Married once, spouse present	.76	3.47	8.32	1.91	3.64	2.56	7.95	12.71	11.60	1848
Remarried, spouse present	.55	2.52	6.11	4.39	5.24	2.65	9.55	11.90	10.35	308
Widowed	1.41	4.24	8.90	3.44	2.66	2.63	10.32	12.98	11.41	41
Divorced	.93	3.00	5.90	4.92	3.59	3.09	11.01	10.42	10.71	125
Separated	1.02	3.81	6.67	3.96	3.02	2.35	10.13	10.70	10.26	54
White, childless										
Married once, spouse present	1.70	5.43	0	4.43	3.73	5.51	15.37	5.44	11.62	131
Never married	1.08	6.66	0	0	2.34	8.25	14.92	3.41	12.52	157
Black, with children										
Married once, spouse present	1.17	1.86	5.67	4.15	4.21	3.75	9.76	11.06	10.08	525
Remarried, spouse present	1.28	2.02	4.79	6.69	4.82	3.83	12.54	10.89	9.71	146
Widowed	1.16	1.91	6.72	4.07	5.44	4.78	10.76	13.32	9.15	68
Divorced	.86	1.36	3.96	7.07	3.14	4.56	12.99	7.96	10.37	170
Separated	1.32	1.60	4.32	6.76	4.39	2.82	11.18	9.77	9.58	170
Black, childless										
Married once, spouse present	3.22	5.02	0	4.32	3.05	5.93	15.27	6.27	11.56	41
Never married	3.43	7.61	0	0	3.73	6.89	14.50	7.16	11.32	44

Note: h_1 = years not worked between school and first job; e_1 = years worked between school and birth of first child (for childless married women, = years worked between school and first marriage; for never-marrieds, = years worked prior to current job); h_2 = years not worked between marriage and first job after birth of first child; e_2 = years worked after h_2 prior to current job (for childless married women, = years worked between first marriage and start of current job); h_3 = years not worked following first job after birth of first child (i.e., since returning to the labor force at the end of h_2); e_3 = years on current job which occurred after birth of first child; Σe = years worked since school; Σh = years of nonparticipation since school; S = years of schooling.

APPENDIX B

Our efforts to resolve the simultaneity problem focused on treating both work experience and home time as endogenous, and on removing the number of children variable from the first-stage equation. In view of the observed insignificance of the OLS coefficient for h_2, we deleted h_2 from the estimates. In addition, for purposes of comparison, we also estimated these equations treating only total work experience as endogenous.

Using first-stage equations in which e and h_1 were regressed on husband's schooling, wife's schooling, wife's age, and variables representing the wife's residence at age 15 and her mother's employment status at the same time, we obtained the estimate shown as equation (2) of Table B-1 (the corresponding OLS estimate is shown here as equation (1) for comparative purposes).

An equation was also estimated in which e_3 was treated as endogenous, as well as e and h_1. This estimate is shown as equation (3). While equations (2) and (3) are conceptually appealing, their coefficients are empirically implausible. This is clearly so for equation (3), with the very large and negative coefficient for tenure (as well as the positive coefficient for home time).

The coefficients in equation (2) are rejected because: a) enlarged estimates of the effects of post-school experience on earnings (i.e., the work experience coefficients are each twice as large and the home time coefficient is nine times as large in equation 2 as compared with equation 1) constitute a dubious resolution of the simultaneity problem;

and b) their magnitudes generate implausible implications--for example, the relative contribution of experience to earnings for a person with mean men's experience would be greater based on the women's equation (2) than based on the men's equation. Given the typical occupational assignments of women, we find this, as well as the magnitude of the depreciation coefficient, to be unreasonable.

Equation (4) appears to be somewhat more plausible, but as noted in the text and in footnote 8, this partial treatment of the simultaneity problem results in biased coefficients for home time.

TABLE 5-1

OLS/2SLS REGRESSION RESULTS[a]

Equation	OLS/2SLS (variables treated as endogenous)	Coefficients (t-values in parentheses)				R^2	F
		e	e_3	h_1	School		
1)	OLS	.011 (4.7)	.009 (3.4)	-.003 (-1.5)	.063 (13.4)	.229	76.0
2)	2SLS (e, h_1)	.022 (2.1)	.018 (7.8)	-.028 (-1.9)	.054 (8.1)	--	63.8
3)	2SLS (e, h_1, e_3)	.028 (2.5)	-.054 (-2.1)	.009 (0.4)	.076 (7.5)	--	47.4
4)	2SLS (e)	.013 (2.3)	.014 (5.7)	-.010 (-5.1)	.061 (12.8)	--	70.7

Sample Size = 1028 (White married women, spouse present).

[a]See Table 1 for explanations of the variables.

APPENDIX C

The wage gap calculations were done as described below.[a] Let:

$\hat{\beta}_{wj}$ = the estimated coefficient of the jth work experience/home-time variable from the earnings function for women;

$\bar{Z}_{wj}$ = the mean value of the jth work experience/home-time variable for women;

$\bar{W}_w$ = the (arithmetic) mean wage of women; and

$\hat{\beta}_{mj}$, $\bar{Z}_{mj}$, and $\bar{W}_m$ = the corresponding values for men.

In this context, the numbers shown in the five column of Table 2 represent:

(1) $\sum_j \hat{\beta}_{wj} \bar{Z}_{wj}$,

(2) $\sum_j \hat{\beta}_{wj} \bar{Z}_{mj}$,

(3) $\dfrac{[\sum_j \hat{\beta}_{wj} (\bar{Z}_{mj} - \bar{Z}_{wj})] \bar{W}_w}{\bar{W}_m - \bar{W}_w}$,

(4) $\dfrac{[\sum_j (\hat{\beta}_{mj} - \hat{\beta}_{wj}) \bar{Z}_{wj}] \bar{W}_w}{\bar{W}_m - \bar{W}_w}$,[b] and

(4') $\dfrac{[\sum_j \hat{\beta}_{mj} (\bar{Z}_{mj} - \bar{Z}_{wj})] \bar{W}_w}{\bar{W}_m - \bar{W}_w}$.

[a] As Ronald Oaxaca has pointed out to us, these calculations are not strictly correct. Since the wage equations used the natural logarithm of the wage rate as the dependent variable, a consistent wage gap calculating procedure should use the geometric mean wages. We have used the arithmetic means so as to make our analysis comparable to M-P's--i.e., they used the arithmetic means also.

[b] It should be noted that this is a slight oversimplification, because the experience variables used in the earnings function for men were not identical to those used in the earnings function for women.

As noted in Table 2, we have calculated two "column (4)" estimates, because of the ambiguity in M-P's statement of how they calculated their column (4) estimates. That is, our column (4') is more closely in line with what the information in the table should presumably be telling the reader--i.e., it measures the implied narrowing of the wage gap that would occur if women had the longer work experience of men; and it differs from column (3) in that the difference in work experience is evaluated in terms of the men's experience coefficients rather than the women's experience coefficients. However, the proportion of the wage gap accounted for by using this procedure is well below the figure reported by M-P. Thus, we concluded that M-P used essentially the procedure defined in (4) above to generate their column (4) estimate, since this procedure does give the result which they reported.

It should be noted that the column (4) estimate gives the implied narrowing of the wage gap that would occur if women had the (larger) work experience coefficients of men, but still had the lower levels of actual work experience. Since the focus of M-P's Table 12 is on the effects of differences in work experience (rather than on the effects of differences in the experience coefficients), our column (4') appears to be the plausible procedure to go with column (3)--rather than column (4). However, we have left column (4) in Table 2 for purposes of comparison.

The specification of the wage gap calculations allows one to examine the effects of changes in individual coefficients on the proportion of the wage gap explained. Thus, e.g., if we call our column (3) estimate G, it is clear that:

$$\frac{\partial G}{\partial \hat{\beta}_{wj}} = \frac{(\overline{Z}_{mj} - \overline{Z}_{wj})\ \overline{W}_w}{\overline{W}_m - \overline{W}_w}.$$

The sign of $\frac{\partial G}{\partial \hat{\beta}_{wj}}$ depends on the sign of $(\overline{Z}_{mj} - \overline{Z}_{wj})$; hence, $\partial G/\partial \hat{\beta}_{wj} > 0$ for work experience and < 0 for home time. M-P's 2SLS procedure, by generating negatively biased home-time coefficients, served to increase G (as compared to the corresponding OLS estimate). The estimate of G based on M-P's 2SLS equation was 45 percent, while that based on their OLS equation was 29 percent. Evaluation reveals that of the 16 percentage point difference between the two estimates, over 13 percentage points were attributable to the effects of the differences in the home-time coefficients. Hence, despite M-P's implication that their 2SLS equation was quite similar to their OLS equation, it is clear that for purposes of examining the wage gap, the two equations are noticeably different.

APPENDIX D

The table below provides the coefficients and means used to generate the wage gap calculations (Table 2). The table corresponds to M-P's Table III, and the relevant portions of their table are reproduced here for purposes of comparison.

TABLE D-1

EXPERIENCE AND HOME-TIME COEFFICIENTS,

AGES 30-44[a]

Source of Estimate	Married Women				Married Men	
	M-P 2SLS		Corrected Data, OLS		M-P OLS	
Variable	β	M	β	M	β	M
SCHOOL	.063	11.3	.063	11.5	.071	11.6
e	.012	9.6	----	----	----	----
e	----	----	.011	10.8	.034	19.4
e^2	----	----	----	----	-.0006	409
e_{55}	.009	3.2	.009	4.1	----	----
H_1	-.015	6.7	-.003	6.1	----	----
H_2	-.006	3.5	----	----	----	----
Wage	----	$2.09	----	$2.02	----	$3.18

[a] β = regression coefficient, M = mean; see Table 1 for explanation of the variables.